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EVALUATING THE QUALITY OF UNITED STATES-GROWN CITRUS FRUITS IN EUROPEAN MARKETS

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EVALUATING THE QUALITY OF UNITED STATES–GROWN CITRUS FRUITS IN EUROPEAN MARKETS

by Paul L. Harding [1]

INTRODUCTION

Citrus-producing countries compete with each other in the sale of fresh citrus fruits in world markets. Special emphasis is placed on total decay; in fact, the amount of decay found is used as an indicator of market life of the fruit. Other important factors that influence price are the appearance and juiciness of the fruit. Buyers also evaluate on uniformity of size, rind color, and freedom from blemishes.

Germany, France, the United Kingdom, and the Netherlands are the principal European countries that import fresh citrus fruits. [2]

Spain leads in the export of oranges, followed by Israel, Morocco, South Africa, and the United States.[2] The United States leads in the export of grapefruit, followed by Israel and South Africa. Italy leads in the export of lemons, followed by the United States and Greece.

Production of all citrus fruits in the United States reached a high point during the crop year of 1961-62.[3] Subsequent freezes reduced production from slightly over 203 million boxes to about 151 million boxes in 1964-65.

The export of fresh citrus fruits from the United States to European markets varies from month to month and year to year. Auction prices for fresh citrus fruits are influenced by quality and supply of fruit. Competition at auction is keen, since bidding price is frequently based on fruit offerings from many producing areas of the world. There is a year-round demand, and some countries are extending their orange plantings with high quality varieties. The wholesaler and the consumer place emphasis on appearance and on oranges that are easily peeled rather than "press" oranges.

RESULTS AND DISCUSSION

1965 Study

The study in 1965 encompassed a broad general survey to evaluate the quality of oranges, grapefruit, and lemons from the United States on arrival at dockside in European ports, in storage warehouses, and at auction, and finally to evaluate the keeping quality of the fruits in retail stores. The observations are based on 48 different shipments, comprised of 290 lots from

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[2] United States Department of Agriculture. Agricultural statistics 1965. pp. 169-177. 1965.

[3] Florida Department of Agriculture cooperating with U.S. Department of Agriculture, Statistical Reporting Service. Citrus summary. p. 5. 1965.

Arizona, California, and Florida, and on the inspection of many available lots during transshipment and marketing.

Valencia oranges from all sources in the United States were usually in good condition at time of ship unloading at the various European ports of call in the 1965 study. Arizona and California Valencias had a uniformly good orange color. Blemishes and rind breakdown were of minor importance, with total decay ranging from 0 to 3 percent for the many lots that were inspected. Florida Valencias on arrival were usually greenish orange and varied slightly in size and rind color. Rind scars, melanose, and stem-end rind breakdown were frequently observed. Most of the oranges had no decay on arrival; however, one shipment had 2 percent and another 5 percent total decay.

The market condition of Marsh grapefruit in the 1965 study ranged from fair to good at time of unloading in European ports. Arizona and California fruit generally had a uniform yellow color. Grapefruit had more blemishes and rind breakdown than oranges; the inspections showed that 0 to 7 percent of the fruit was blemished by scars and melanose. Rind breakdown in the various shipments ranged from 0 to 8 percent and total decay from 2 to 7 percent.

Florida Marsh grapefruit in commercial shipments were greenish yellow when inspected at time of ship unloading. This fruit also showed slight variation in size and rind color. About 10 percent of the fruit inspected was marred with melanose, scars, and other blemishes; in one lot, 20 percent of the fruit was affected. Rind breakdown ranged from 7 to 9 percent and total decay from 1 to 10 percent. Grapefruit with "bronzing" was looked on with disfavor by importers and the foreign inspection services.

In both the orange and grapefruit exports in 1965, the condition and quality of the fruit did not show important change from the time of unloading from the ship to destination at the retail market, except in those cases where grapefruit were held for extended periods in storage warehouses. Rind breakdown of grapefruit ranged from 10 to 30 percent after 3 weeks' storage at about 40° F., which is too low a temperature for grapefruit.

In the 1965 study, California lemons were generally in good condition at the time of unloading at the various ports in Europe. Most lots were in fair to good condition even after transshipment from Rotterdam to Copenhagen or from Rotterdam to Oslo and Stockholm. At the time of inspection, these lemons were yellow-green, smooth, and comparatively free of decay; however, two lots on arrival at Rotterdam were rough and had rind scars ranging from 0 to 3 percent and total decay ranging from 0.5 to 3 percent. Some lemon shipments were reported as having total decay exceeding 10 percent, but such poor arrival conditions of lemons were not observed during this study.

1966 Study

The purpose of the 1966 study was to relate the market quality of Florida grapefruit on the export market to type of container and transit environment.

During April and May 1966, three export shipments of Marsh grapefruit were made from Florida to LeHavre, France. The grapefruit for the three shipments were from the same grove and packinghouse in Wabasso, Fla. Each test in this group was made up of ten 4/5-bushel fiberboard cartons to be compared with ten 4/5-bushel wirebound wooden crates of fruit. In addition to the test fruit, the commercial shipments included large volumes of fiberboard cartons and wirebound crates of grapefruit from this and other sources. Sampling inspections and observations were made of these shipments also.

In test Nos. 1 and 2, the shipments of fruit moved by trailer-truck from Wabasso, Fla., to New York City, and by United States Lines from New York City to LeHavre, France. At New York City the fiberboard cartons and the wirebound crates of grapefruit were stacked 4-high on wooden pallets, 64 containers to the pallet. These pallets of fruit were loaded 2-high in the holds of the ships. The test packages and those containing recording thermographs were placed in the bottom layers of the bottom pallets. The fruit in these two tests was shipped under ventilation during the entire transit period from Florida to LeHavre, France. Unavoidable delays of several days occurred between unloading at LeHavre and first inspection of the fruit because of transfers from pier to warehouse.

Grapefruit export test shipment No. 1 left Florida on March 28, was loaded aboard the *American Challenger* in New York City on April 1, and arrived at LeHavre, France, on April 7. The percentage of total decay on arrival was small (table 1). Likewise, very little rind breakdown developed during transit. The grapefruit were reinspected after a 2-week holding test at 50° F. Some of the commercial lots of grapefruit were particularly "weak," being soft and overripe at time of shipment as well as at time of arrival at LeHavre. This fruit should not have been exported because its condition resulted in the development of excessive amounts of *Penicillium* and blossom-end decay during the transit and marketing periods.

Grapefruit export test shipment No. 2 left Florida on April 12, was loaded aboard the *American Champion* in New York City on April 15, and arrived at LeHavre, France, on April 23. The grapefruit in this shipment was even more advanced in ripeness than that in test No. 1, rendering it more susceptible to decay; this was reflected in the total decay (table 1).

Grapefruit export test shipment No. 3 was loaded at Tampa, Fla., aboard the Swedish-American Lines' M/S *Vasaholm* on April 22, and arrived at LeHavre, France, on May 5. Fruit comparable to that in test No. 2 made up the test packages in this test.

In the original planning, the export shipments for test Nos. 2 and 3 were to have been made within 1 or 2 days of each other; however, because of the delay in the arrival of the M/S *Vasaholm* at Tampa, the grapefruit for test No. 3 was stored at Orlando at 50° F. from April 12 to 21 before being transported to Tampa, where it was loaded on the ship on April 22. The transit and holding time for this shipment was 24 days from Florida to LeHavre, as compared to 13 days transit and holding time for test No. 2.

Unlike the containers in test Nos. 1 and 2, the containers of grapefruit in test No. 3 were not placed on pallets but were stacked 8-high. Dunnage was placed on the third and sixth layers with chimney stacks throughout the load. Air movement was from top to bottom. The test packages of fruit and those containing recording thermographs were placed in the bottom layer of the ship's hold. The grapefruit in this test were shipped under refrigerated stowage at 50° F. The fruit temperature rose sharply at the terminal in Tampa during loading of the ship. See figure 2 on page 8.

TABLE 1.--Percentage of total decay in Florida Marsh grapefruit after shipment in fiberboard cartons and wirebound crates to LeHavre, France, April and May 1966

Test No.	Transit and holding period	Fiberboard cartons		Wirebound crates	
		First inspection	2d inspection, after 14 days at 50° F.	First inspection	2d inspection, after 14 days at 50° F.
	Days	Percent	Percent	Percent	Percent
1[1]............	14	0.8	4.0	1.5	4.6
2[2]............	13	1.0	(4)	9.0	(4)
3[3]............	24	4.0	(4)	4.0	(4)

[1] Shipped under ventilation, *American Challenger*.

[2] Shipped under ventilation, *American Champion*.

[3] Shipped under refrigeration, at 50° F., M/S *Vasaholm*.

[4] Test packages not reinspected at LeHavre. Grapefruit sold on Paris market immediately on arrival because of ripeness of fruit and susceptibility to decay.

Cartons vs. Crates

European importers indicated a general preference for the fiberboard carton over the wirebound crates. However, late in the shipping season when citrus fruits were very ripe and more subject to bruising and decay, the preference was for the wirebound crates. Decayed fruit always present marketing problems. The moisture from rotten fruit soaks through the fiberboard carton and makes large, discolored, unsightly, wet spots. Although the same number of rotted fruit may be in the two types of containers, the presence of decayed fruit is not as obvious to the importer, wholesaler, or retailer when the fruit is in the wirebound crate.

In the 1966 study, consideration was given to the two types of containers as related to the market quality of grapefruit on arrival in Europe. Because of their flexibility, the wirebound crates "bellied out," resulting in a jumble pack of grapefruit within the container. A jumble pack of fruit was not observed when the fruit was packed in fiberboard cartons. Because of the flexibility of the wirebound crates, the diameter of the grapefruit of sizes 80 and 96 should be increased to maintain a tight pack. Tight packs are particularly essential in the shipment of ripe and very ripe fruit in order to prevent bruising and to control decay.

In test No. 1, on arrival at LeHavre, the average amount of decay in fiberboard cartons was 0.8 percent and in wirebound crates 1.5 percent. The type of container had little effect on the small amount of rind breakdown found. During the 2-week, 50° F. holding period, decay increased to 4 percent in the fiberboard cartons and to 4.6 percent in the wirebound crates (table 1).

In test No. 2, on arrival at LeHavre, the average amount of decay in the fiberboard cartons was 1 percent and in the wirebound crates 9 percent. As in test No. 1, the amount of rind breakdown was small and insignificant, with no differences resulting from type of container.

In test Nos. 1 and 2, the temperature of the grapefruit in the wirebound crates averaged 2 to 3 degrees lower than that in the fiberboard cartons during transit (fig. 1).

As in test Nos. 1 and 2 (fig. 1), grapefruit temperatures in test No. 3 were slightly lower in the wirebound crates than in fiberboard cartons (fig. 2). At the time of arrival, the average decay was 4 percent in both types of containers (table 1). As in test Nos. 1 and 2, the amount of rind breakdown of grapefruit in test No. 3 was small and was not affected by the type of container used.

These results are in general agreement with the findings of Christ[4] who reported, "More wastage generally developed in cartons than in wooden cases when no diphenyl was used. No significant differences were found between cartons and cases when the fruit was protected with diphenyl. In one experiment cartons even proved to be better than standard cases. It became obvious that diphenyl was more effective in cartons than in open wooden cases."

Neither the fiberboard cartons nor the wirebound crates proved totally satisfactory when containers of fruit were roughly handled during transit and transport.

Stacking Containers on Pallets

The shipment of containers of fruit stacked on pallets is becoming more popular as a result of the trend toward mechanization. The United States Lines uses pallets and fork lifts in stowing citrus fruit in the ships' holds. Their pallets are larger than those commonly used in overseas warehouses, and consequently the containers of fruit must be restacked onto the smaller pallets upon arrival. The rolling of the ship causes individual wirebound crates on the pallets to shift more than fiberboard cartons.

Fast and Regular Transit

European importers stress the importance of increasing the market life of fruit by decreasing the length of the transit period. Fast truck or truck-rail transit can be made to Saint John, Montreal, New York City, and other shipping points and then fast ocean transit made to the

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[4] Christ, R. A. 1965. Waste in standard nailed cases, wirebound boxes & ventilated fibreboard cartons. South African Citrus Jour. No. 376, pp. 15-19. April 1965.

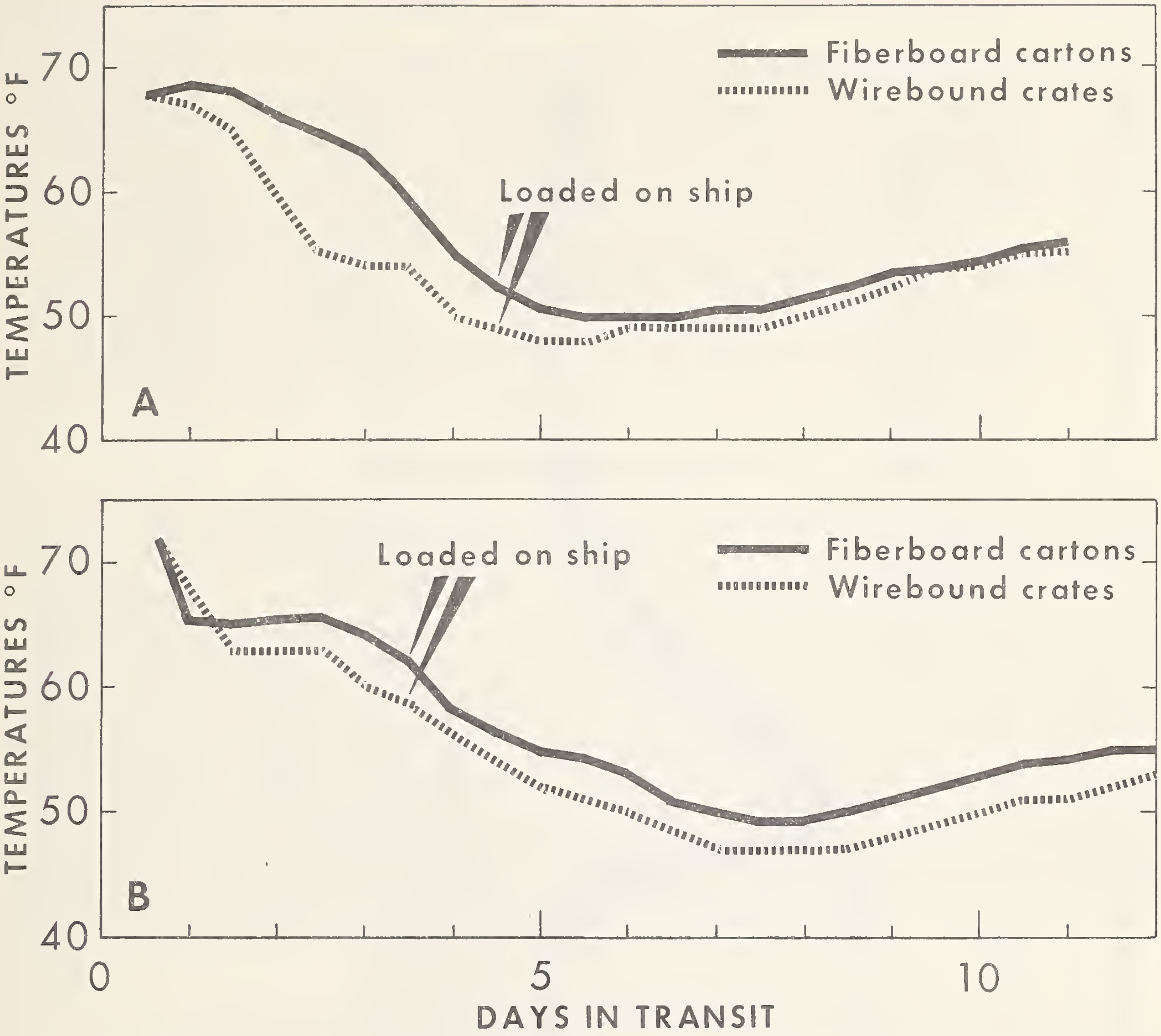

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Figure 1.--Temperatures of grapefruit in fiberboard cartons and wirebound crates from Wabasso, Fla., to LeHavre, France, 1966: (A) Test No. 1, ventilated stowage, American Challenger; (B) Test No. 2, ventilated stowage, American Champion.

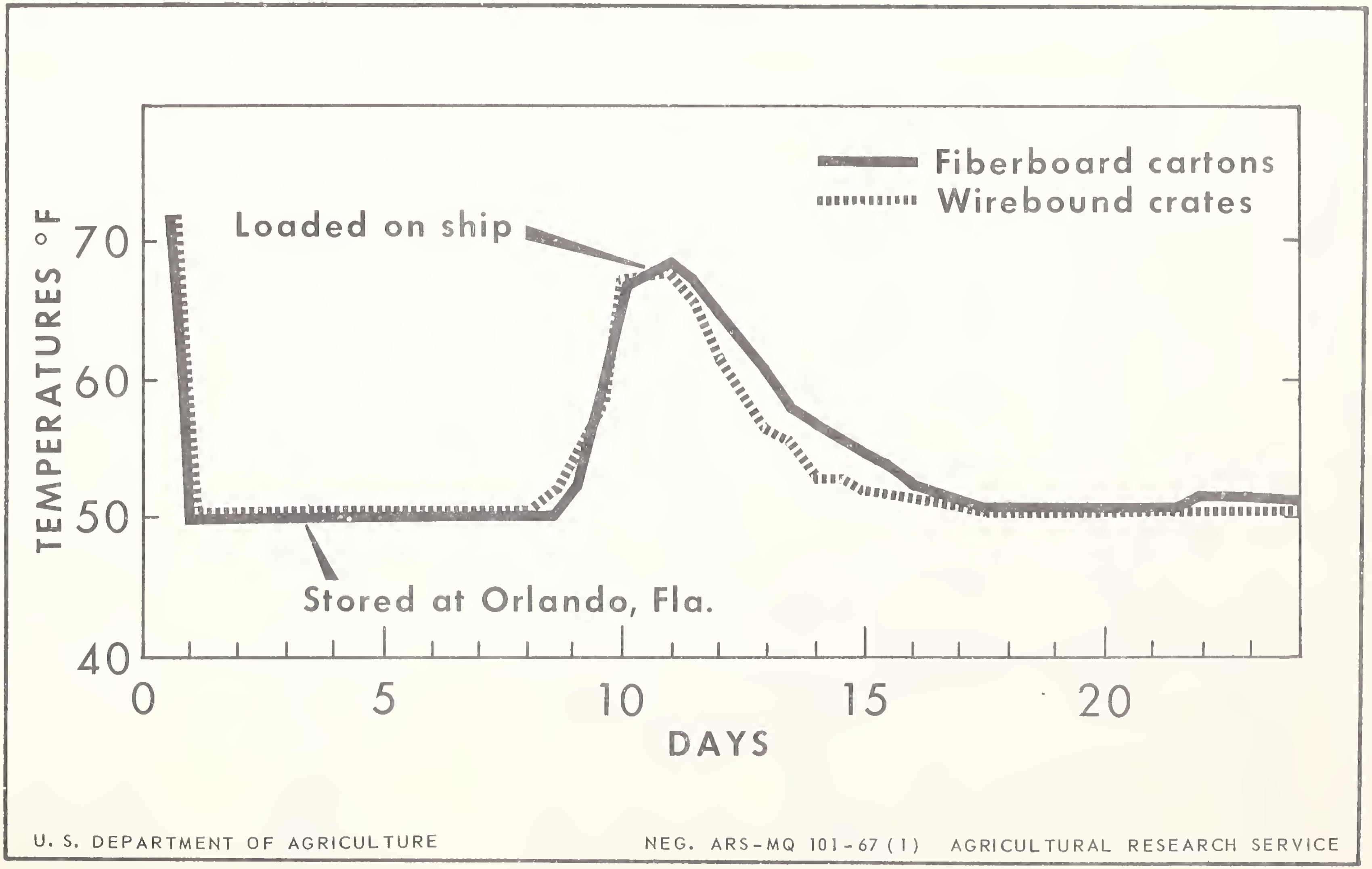

Figure 2.--Temperatures of grapefruit in fiberboard cartons and wirebound crates from Tampa, Fla., to LeHavre, France, 1966: Test No. 3, during holding and refrigerated stowage, M/S Vasaholm.

different European ports of call. This fast transit would add many days to the market life of the fruit.

The costs are about the same for transporting each 4/5-bushel container of fruit by truck from Wabasso, Fla., to New York City, and then by fast ventilated transport ship of the United States Lines from New York City to LeHavre, France, as compared with costs by slow ventilated transport ship from Tampa, Fla., direct to LeHavre; they range from approximately $1.15 to $1.25 per container, depending on the methods employed in trucking and mechanized handling of the containers. On the other hand, cost by refrigerated transport ship from Tampa, Fla., to LeHavre is 20¢ more per container than by ventilated transport ship.

Fast shipments from the United States are especially important since citrus-producing countries such as Spain and Italy can make deliveries to large European markets in a matter of 4 or 5 days.

Piggyback-fishyback refrigerated containerization shipments have shown promise, and this method of transportation is being developed.

Refrigerated and Ventilated Stowages

In test No. 3, which was shipped under refrigerated stowage of 50° F., from 5 to 6 days were required to reduce the fruit temperature from 68° to 51° (fig. 2). Despite the longer transit period in this shipment than in the other two 1966 shipments, decay was partly controlled under refrigerated stowage.

Refrigerated ship stowage is more costly than ventilated stowage; however, with refrigerated stowage there is the assurance of good citrus arrivals, provided the proper temperature and humidity are maintained for the different kinds of citrus fruits. A 32° F. temperature and 85 to 95 percent humidity are recommended for storage of Florida-grown Valencia oranges.[5] The recommended storage conditions are 60° temperature and 85 to 95 percent humidity for early- and midseason-harvested Marsh and Ruby Red grapefruit and 50° temperature for spring-harvested grapefruit.[6] The poorest storage temperature is about 40°. This undesirable storage temperature is pointed out because ventilated stowage of citrus fruit can be risky when outside temperatures range near 40° during ocean transit. Observations of citrus fruit arrivals at European ports showed excessive rind breakdown of Valencia oranges and Marsh grapefruit shipped by ventilated stowage under adverse temperature conditions.

Harbors, Storage Sheds, and Warehouses

Very good facilities are provided at most European ports where citrus fruit from the United States is unloaded. In world trade, Rotterdam's harbor ranks first. It has facilities to berth 200 ships.[7] Most large ports provide good covered storage facilities. Storage at dockside is usually of a temporary nature, although the fruit may be held as long as 3 weeks pending higher prices. The storage sheds often are equipped with refrigerated rooms, in addition to the common cool storage space. Citrus fruit usually is moved out of the sheds following sale at auction. The principal importers usually operate small modern refrigerated warehouses where limited supplies of citrus fruit are stored to meet emergency orders or to wait for higher prices.

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[5] Harding, Paul L., Wiant, James S., Hruschka, H. W., Sunday, M. Bryan, and Kaufman, J. The effect of prestorage packinghouse treatments on the control of decay of Florida oranges during storage at Orlando, Florida, and New York City, N. Y., 1951. U.S. Dept. Agr. AMS-233, 21 pp. 1958.

[6] Chace, William G., Jr., Harding, Paul L., Smoot, John J., and Cubbedge, Randall H. Factors affecting the quality of grapefruit exported from Florida. U.S. Dept. Agr. Market. Res. Rpt. 739, 21 pp. 1966.

[7] Anonymous. Rotterdam gets lift from containerization. Traffic Management, p. 42. Sept. 1964.

Fruit Auction and the European Market

Citrus fruits for European markets usually enter wholesale and retail trade by means of the fruit auction. Before the auction, the authorized wholesaler has opportunity to inspect representative samples of citrus fruits. He carefully reviews the produce and bases his bid on fruit quality as judged by appearance, juiciness, taste, and freedom from blemishes and decay. Undoubtedly, the reliability of the shipper in exporting high quality fruit is considered, together with the export certification that specifies the grade. At LeHavre, Antwerp, and Hamburg, repacking citrus fruit is required when total decay exceeds 3 percent. However, at Rotterdam, Copenhagen, and other European auctions, importers may choose to accept a loss in price rather than repack the fruit. But even in such cases, the official inspector is likely to issue a warning to importer and shipper that the lot of fruit being offered for sale fails to meet minimum market requirements. An official warning is regarded as a reflection on the shipper. When a warning is given, it is because of the wide variation in fruit color and size and in too high a percentage of total defects and blemishes, such as bruises, injuries, scale, melanose, limb scars, and decay, within the packed box.

SUMMARY AND CONCLUSIONS

Studies were conducted in Europe to evaluate the market quality of citrus fruits shipped from the United States. This survey covers the periods from February 25 to May 8, 1965, and from March 28 to May 10, 1966. Fruit quality was determined after the ships were unloaded, at fruit auctions, in storage warehouses, and finally at retail levels. The findings are based on careful inspection and observation of citrus fruits in and near London, Brussels, LeHavre, Paris, Zurich, Berne, Hamburg, Frankfurt, Rotterdam, Copenhagen, Oslo, Stockholm, and Helsinki.

These studies showed that most of the citrus fruit shipments from Arizona and California had good appearance upon arrival in European ports, at auction, and after transit to retail markets. Florida oranges were slightly greenish orange and Florida grapefruit slightly greenish yellow. The survey also showed that citrus fruits were discounted at auction because of such defects as rind breakdown, insect injury, variability in size and rind color, and blemishes such as melanose, rust mite, and total decay.

In 1966, two ventilated export test shipments of grapefruit showed more shifting of the wirebound crates than fiberboard cartons on the pallets in the ship's hold. Because of the flexibility of the container, the wirebound crates "bellied out." This resulted in a slack and jumble pack and slightly more decay than was found in the cartons. On the other hand, overripe grapefruit, shipped in fiberboard cartons late in the season, presented a marketing problem. Moisture from decayed fruit soaked through the fiberboard cartons, making large, discolored, unsightly, wet spots.

In 1966, the refrigerated export test shipment of grapefruit was not affected by type of container used, and no significant difference was found in total decay between grapefruit in the wirebound crates and in the fiberboard cartons. The containers of fruit were not stacked on pallets in the ship's hold.

During the transit period, the temperatures of grapefruit in the test packages in both ventilated and refrigerated stowage were slightly lower when the fruit was packed in wirebound crates than in fiberboard cartons.

A special export standard for oranges and grapefruit should be provided and adhered to by shippers in the United States. Such a standard would be in keeping with the views of the foreign importers and inspection officials.

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